

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE #44

In re Application of: )  
 )  
Michael I. Nerenberg et al. ) **Group Art Unit:** Not Assigned  
 )  
Serial No.: Not Assigned ) **Examiner:** Not Assigned  
 )  
Filed: Herewith )  
 )  
For: **MAGNETIC BEAD-BASED** )  
 **ARRAY FOR GENETIC** )  
 **DETECTION** )

**PRELIMINARY AMENDMENT**

BOX PATENT APPLICATION  
Commissioner for Patents  
Washington, D.C. 20231

Sir:

Prior to examination hereof, please amend the subject application as follows:

**IN THE SPECIFICATION**

Page 1, after the title, please insert the following paragraph:

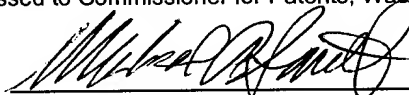
--This application is a continuation of PCT International Application No.  
PCT/US00/10121, filed on April 12, 2000, which claims priority to U.S. Application Serial  
No. 60/129,389, filed on April 13, 1999, the disclosures of which are incorporated herein by  
reference.--

OC-93873.1

**CERTIFICATE OF MAILING (37 C.F.R. §1.10)**

I hereby certify that I have reasonable cause to expect that this paper (along with any referred to as being attached or enclosed) is being deposited with the United States Postal Service on the date shown below with sufficient postage as 'Express Mail Post Office To Addressee' in an envelope addressed to Commissioner for Patents, Washington, DC 20231.

Express Mail Label No.: EL622500659US  
Date of Deposit: October 5, 2001

  
Micheal A. Smith

**IN THE CLAIMS**

Please cancel claims 1-9 without prejudice.

Please add the following new claims:

---

10. A device for detecting a target molecule in a sample solution comprising:

92 a flow cell having channels for receiving a flowable medium, wherein the flow cell further has one or more micro sensors for the manipulation and/or detection of magnetic beads, wherein the micro sensors comprise sensor pads and electrodes associated with each sensor pad, wherein the sensor pads comprise attached polynucleotide probes capable of hybridizing to a target nucleic acid sequence;

and a population of magnetic beads within the flow cell, wherein each of the magnetic beads comprises an attached first set of attached polynucleotides comprising a target nucleic acid specific sequence 3' of a restriction endonuclease recognition sequence, wherein the polynucleotides are capable of participating in a strand displacement amplification reaction.

11. The device of claim 10 wherein at least one of the magnetic beads further comprises an attached second set of single stranded polynucleotides comprising the target nucleic acid specific sequence 3' of the restriction endonuclease recognition sequence of the first set, wherein the polynucleotides of the second set are not cleavable by the restriction endonuclease which recognizes the restriction endonuclease recognition sequence.

12. The device of claim 10 wherein the population of magnetic beads comprises a plurality of sub-populations of magnetic beads, wherein the target nucleic acid specific sequence of the first set of attached polynucleotides on the magnetic beads of each sub-population is different.

13. The device of claim 12 wherein there are at least 20 sub-populations of magnetic beads.

14. The device of claim 10 wherein the magnetic beads comprise iron oxide.

15. The device of claim 14 wherein the sensor pads are capable of exerting a force of about 5 pN on the magnetic beads.

16. The device of claim 10 wherein the sensor comprises a pseudo spin-valve (PSV) material.

17. The device of claim 10 wherein the sensor comprises between 64 and 4096 individual sensor pads.

18. The device of claim 10 further comprising a magnet functionally positioned for sweeping non-specifically bound magnetic beads from the surface of the sensor pads.

19. A method for detecting target molecules comprising

- (a) mixing the microbeads of claim 1 or 5 with a sample solution containing at least one target nucleic acid of interest;
- (b) contacting the target nucleic acid to either the microbeads or the sensor pads;
- (c) performing a strand displacement reaction on the target nucleic acid sequence;
- (d) contacting the microbeads following the reaction of (c) with a micro sensor;
- (e) binding the microbeads to the sensor; and
- (f) detecting the presence of the microbeads bound to the sensor.

20. A device for detecting a target molecule in a sample solution comprising:

a flow cell comprising channels for receiving a flowable medium, wherein the flow cell further comprises at least one micro sensor for the manipulation and/or detection of the magnetic beads, wherein the micro sensors comprise sensor pads and electrodes associated with the sensor pads, wherein at least some of the pads further comprise a first set of attached polynucleotides comprising a target nucleic acid specific sequence 3' of a restriction endonuclease recognition sequence, wherein the polynucleotides are capable of participating in a strand displacement amplification reaction; and

a population of magnetic beads within the flow cell, wherein each of the magnetic beads comprises attached polynucleotide probes capable of hybridizing to a target nucleic acid sequence.

21. The device of claim 20 wherein at least one of the sensor pads further comprises an attached second set of single stranded polynucleotides comprising the target nucleic acid specific sequence 3' of the restriction endonuclease recognition sequence of the first set, wherein the polynucleotides of the second set are not cleavable by the restriction endonuclease which recognizes the restriction endonuclease recognition sequence.

22. The device of claim 20 wherein the wherein the target nucleic acid specific sequence of the first set of attached polynucleotides on a plurality of the sensor pads is different.

23. The device of claim 22 wherein the target nucleic acid specific sequence of the first set of attached polynucleotides on at least twenty of the sensor pads is different.

24. The device of claim 20 wherein the magnetic beads comprise iron oxide.

25. The device of claim 24 wherein the sensor pads are capable of exerting a force of about 5 pN on the magnetic beads.

26. The device of claim 20 wherein the sensor comprises a pseudo spin-valve (PSV) material.

27. The device of claim 20 wherein the sensor comprises between 64 and 4096 individual sensor pads.

92  
cont

28. The device of claim 20 further comprising a magnet functionally positioned for sweeping non-specifically bound magnetic beads from the surface of the sensor pads.

---

Respectfully submitted,

LYON & LYON LLP

Dated: October 5, 2001

By: 

Patrick S. Eagleman  
Reg. No. 44,665

633 West Fifth Street, Suite 4700  
Los Angeles, California 90071-2066  
(949) 567-2300

FOR FILING